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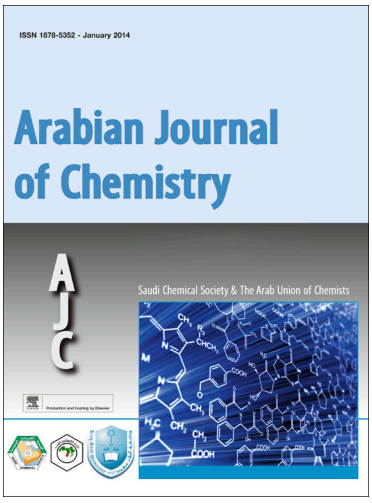

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Synthesis, Characterisation and Photocatalytic performance of ZnS coupled Ag_2S Nanoparticles: A Remediation Model for Environmental Pollutants

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Abstract

The growing demand of industries has led to environmental degradation due to excessive release of toxic chemicals. Nanotechnology has developed to combat the impacts integrated with industrial revolution. The present investigation proposes a remediation model for toxic dyes and poly aromatic hydrocarbons by effective use of nanotechnology. For this purpose, zinc sulphide (ZnS), silver sulfide (Ag_2S)and bimetallic ZnS-Ag_2S are synthesized from a single source precursor and evaluated as potential photocatalytic agents. The synthesized nanoparticleswere characterized by a range of techniques like UV-visible, PL, XRD, EDX, TEM and TGA. The results indicated that preparednanoparticles were crystalline, spherical in shape, possess obvious atomic planes with a size in the range of 6-12nm.

Each of the synthesized material was tested as potential photocatalyst candidate for the degradation of representative azo-dyes (Crystal Violet, Congo Red) and polyaromatic hydrocarbons (Naphthalene, Phenanthrene and Pyrene)under visible light irradiation source. The degradation efficiency of the synthesized nanoparticles was calculated to be more than 70% for Crystal Violet and 80%for Congo Red upon contact with the dye solutions for 50 minutes and pseudo second order kinetic model was found to be the best fit. The synthesized nanoparticleswere also effective in its own significance for the degradation of polyaromatic hydrocarbons. The fragmentation study of polyaromatic hydrocarbons using nanoparticles postulates that phthalic acid pathway is the predominant mechanism for PAHs.It is recommended that environmental compartment with mix pollutants can conveniently be treated with a single material to an appreciable extent. The study offers economical and environment friendly remediation model.

KEYWORDS: Single source precursor; Azo-dyes; Poly aromatic hyrocarbons; Environmental remediation; Photocatalysis

1. Introduction

Natural environment is continuously being subjected to effects of chemicals emitted during anthropogenic as well as natural processes. The accumulation of these chemicals is generating